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Mr. R. P. Snaider  
Task Manager Safety Issue A-12  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

December 3, 1980

Dear Sir:

ADDITIONAL GUIDANCE ON "POTENTIAL FOR LOW  
FRACTURE TOUGHNESS AND LAMELLAR TEARING  
ON PWR STEAM GENERATOR AND REACTOR  
COOLANT PUMP SUPPORTS", NUREG-0577

Modifications of NUREG-0577 in the May 19 and 20, 1980 letters limit the use of materials having yield strength (YS) greater than 180 ksi. These materials can be used only in the cases where their failure would not impair a safe shutdown. Two reasons are given for the restricted use: (1) low resistance to brittle fracture and (2) high sensitivity to stress corrosion cracking (SCC).

We would like to point out that the statement on brittle fracture resistance is not necessarily true for at least some high strength steels. References 1 and 2 show that fracture toughness of maraging steels is rather good, especially for the lower strength grades (YS=200 to 250 ksi). It should also be mentioned that dynamic loading does not affect fracture toughness of these steels, which is not the case for low strength steels where dynamic loading can significantly reduce toughness.

According to Figure 2 of the May 19 and 20 letters, maraging steels are less sensitive to SCC than low alloy steels at the same strength level. A literal application of the 180 ksi requirements would lead to a contradiction. For example, we would be allowed to use a low alloy steel with YS=180 ksi which has KISCC=28 ksi  $\sqrt{\text{in.}}$ , but could not use a maraging steel with YS=250 ksi which has KISCC=35 ksi  $\sqrt{\text{in.}}$

Considering the above facts, we recommend that NUREG-0577 allow the option to use high strength steels (YS > 180 ksi) providing the following are met:

1. Fracture toughness is properly documented.
2. Fracture mechanics analysis is performed to show that the measured fracture toughness is adequate for the application, that is, the analysis will have to assure that the critical crack size is large enough to be detected by the specified nondestructive examination method.

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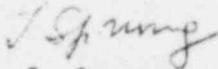
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3. An analysis for SCC is performed using the curves in Figure 2 of the May 19 and 20 letters.

Very truly yours,



I. Sprung  
Senior Materials Engineer

IS:MDM

References:

- 1) Damage Tolerant Design Handbook, Battelle Columbus Laboratories.
- 2) Plane Strain Fracture Toughness Data Handbook for Metals, Army Mat. Res. Center, AD-773673.